

## Regular review

### Effectiveness of interventions to help people stop smoking: findings from the *Cochrane Library*

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Peto estimates that current cigarette smoking will cause about 450 million deaths worldwide in the next 50 years. Reducing current smoking by 50% would avoid 20-30 million premature deaths in the first quarter of the century and about 150 million in the second quarter.<sup>1</sup> Preventing young people from starting smoking would cut the number of deaths related to tobacco, but not until after 2050. Quitting by current smokers is therefore the only way in which tobacco related mortality can be reduced in the medium term. There is evidence that some form of treatment aids an increasing number of successful attempts to quit.<sup>2</sup> This review aims to summarise evidence for the effectiveness of the available interventions.

#### Methods

The Cochrane Tobacco Addiction Review group identifies and summarises the evidence for interventions to reduce and prevent tobacco use; it produces and maintains systematic reviews to inform policymakers, clinicians, and individuals wishing to stop smoking. Twenty systematic reviews are available in the *Cochrane Library* and have contributed to the evidence base for smoking cessation guidelines.<sup>3</sup>

Details of the methods and results of each review are available in the *Cochrane Library* (abstracts at [www.update-software.com/ccweb/cochrane/revabstr/g160index.htm](http://www.update-software.com/ccweb/cochrane/revabstr/g160index.htm)). The reviews summarise results from randomised controlled trials with at least six months' follow up. Sustained abstinence is the preferred outcome, but point prevalence rates are used when these are not available. Where possible, the reviews include estimates of treatment effect based on meta-analysis, expressed as Peto odds ratios<sup>4</sup> with 95% confidence intervals. An odds ratio greater than 1 indicates more quitters in the intervention group. The odds ratio assumes that the relative effects of treatment are constant despite the use of different outcome measures. The absolute quit rate is generally higher with the outcome of point prevalence and lower with the more rigorous outcome of sustained abstinence. The absolute rate also differs according to baseline quit rates in different populations. Treatment usually produces more quitters in populations with a higher baseline stopping rate (for example, motivated patients

#### Summary points

Advice from doctors, structured interventions from nurses, and individual and group counselling are effective interventions

Generic self help materials are no better than brief advice but more effective than doing nothing; personalised materials are more effective than standard materials

All forms of nicotine replacement therapy are effective

The antidepressants bupropion and nortriptyline increased quit rates in a small number of trials; the usefulness of the antihypertensive drug clonidine is limited by side effects

Anxiolytics and lobeline are ineffective

The effectiveness of aversion therapy, mecamlamine, acupuncture, hypnotherapy, and exercise is uncertain

attending a specialist smoking clinic) and fewer when the baseline rate is lower (for example, all smoking patients attending a general practitioner).<sup>5</sup> Therefore absolute risk differences and numbers needed to treat, though more understandable outcomes, cannot be calculated reliably from the pooled data.

#### Interventions from doctors and nurses

Simple advice from doctors during routine care has been studied in 31 trials including over 26 000 smokers in primary care, hospital wards, outpatient clinics, and industrial clinics.<sup>6</sup> The Cochrane review found that brief advice increased the quit rate (odds ratio 1.69, 95% confidence interval 1.45 to 1.98). More intensive advice was slightly more effective. Nurses providing individual counselling were also effective.<sup>7</sup> Studies of advice from nurses as part of general health promotion have not shown a similar effect.

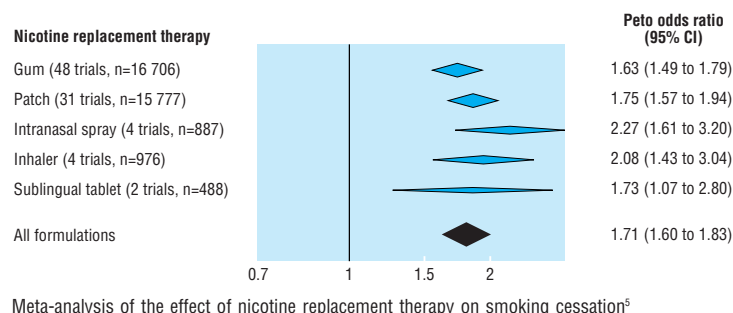
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## Behavioural and psychological interventions

Motivated smokers may seek help from smoking cessation counsellors or clinics, either one to one or in a group. Both individual counselling and group therapy increase the chances of quitting.<sup>8,9</sup> The Cochrane review of nine studies found that individual counselling was better than brief advice or usual care (1.55, 1.27 to 1.90).<sup>9</sup> Group therapy was more effective than self help materials but not consistently better than other interventions involving personal contact.<sup>8</sup> There was no difference between group and individual therapy in the two trials that included both. Groups are theoretically more cost effective, but their usefulness may be limited by difficulties in recruiting and retaining participants.<sup>10</sup>

In the trials the therapists were usually clinical psychologists, but the interventions drew on a variety of psychological techniques rather than a distinctive theoretical model. There is therefore little evidence about the relative effectiveness of different psychological approaches. Twenty four trials, mainly small, studied aversion therapy, which pairs the pleasurable stimulus of smoking to an unpleasant stimulus, with the goal of extinguishing the urge to smoke. The Cochrane review found little effect of non-specific aversive stimuli and limited evidence that rapid smoking (inhaling deeply and frequently) might reduce smoking.<sup>11</sup> A pharmacological method of aversive stimulation, silver acetate, causes an unpleasant taste when combined with cigarettes. Two studies of silver acetate showed no evidence of benefit, although confidence intervals were wide (1.05, 0.63 to 1.73).<sup>12</sup>

## Self help

Behavioural methods can be delivered through self help materials, including written leaflets and manuals, audiotapes, videotapes, and computer programs. Potentially, they can reach many more people than interventions delivered by therapists. They may be given as an adjunct to brief advice or without any personal contact.<sup>13</sup> The Cochrane review found that self help materials had no additional benefit over brief personal advice. However, in 12 trials with no face to face contact, self help materials had a small effect when compared with no intervention (1.23, 1.02 to 1.49).

More recent approaches have concentrated on making self help materials appropriate to the needs of individuals. After baseline information is collected, smokers receive materials matched on demographic or behavioural characteristics such as motivation and

readiness to change.<sup>14</sup> In eight trials, individually tailored materials were more effective than standard or stage based materials (1.41, 1.14 to 1.75). Materials tailored solely to group characteristics (such as age, sex, or race) were no better than standard materials. Telephone contact is an economical way of adding some personal contact to self help materials. In six trials there was benefit of proactive calls from a counsellor, and in one a reactive quitline improved success rates. Increasingly, materials are available on computer or through the internet, though there is as yet little evidence of whether these methods improve success.

## Nicotine replacement therapy

This treatment aims to replace the nicotine obtained from cigarettes, thus reducing withdrawal symptoms when stopping smoking. Nicotine replacement is available as chewing gum, transdermal patch, nasal spray, inhaler, sublingual tablet, and lozenge. The Cochrane review of over 90 trials found that nicotine replacement helps people to stop smoking.<sup>5</sup> Overall, it increased the chances of quitting about one and a half to two times (1.71, 1.60 to 1.83), whatever the level of additional support and encouragement. The quit rate was higher in both placebo and treatment arms of trials that included intensive support, so nicotine replacement seems to increase the rate from whatever baseline is set by other interventions. Since all the trials of nicotine replacement have included at least brief advice, this is the minimum that should be offered. Most of the studies involved smokers with evidence of nicotine dependence. The usefulness of the technique for less dependent smokers is uncertain.

There is little direct evidence that one nicotine product is more effective than another (figure). Thus the decision about which product to use should be guided by individual preferences. The patch delivers a steady level of nicotine throughout the day and can be worn unobtrusively. The main side effect is skin irritation. Wearing the patch only during waking hours (16 hours a day) is as effective as wearing it for 24 hours a day. Eight weeks of patch therapy is as effective as longer courses, and there is no evidence that tapered withdrawal is better than abrupt withdrawal. The inhaler resembles a cigarette and may be useful for people who want a substitute for the act of smoking. The nasal spray delivers nicotine more rapidly and may satisfy surges of craving. Gum, spray, inhaler, and lozenges may all cause irritation in the nose or mouth. For highly dependent smokers, a 4 mg dose of nicotine gum is more effective than a 2 mg dose.

Some clinicians recommend combinations of nicotine products (for example, providing a background nicotine level with patches and controlling cravings with faster acting preparations). There have been too few trials to provide clear evidence about the effectiveness of patch and gum combinations. One trial showed greater efficacy for nasal spray and patch than for patch alone,<sup>15</sup> but it is unclear whether this simply reflected a higher total dose of nicotine. High dose nicotine patches were marginally more effective in six trials that compared them with standard doses (1.21, 1.03 to 1.42).

## Pharmacological interventions

### Antidepressants and anxiolytics

Anxiolytics are not effective, but there is growing evidence that some antidepressants increase quitting.<sup>16</sup> The atypical antidepressant bupropion is thought to inhibit neuronal uptake of noradrenaline and dopamine. A slow release form is licensed for smoking cessation in the United States. The manufacturers have recently released the product in the Netherlands and plan to launch it in other parts of Europe during 2000. There is evidence from two large published trials and two smaller unpublished ones that bupropion is effective (2.73, 1.90 to 3.94).<sup>16</sup> These trials recruited heavier smokers, who were also offered behavioural support. One trial found that bupropion alone or combined with a nicotine patch was more effective than a nicotine patch alone.<sup>17</sup> On its own this finding is insufficient to define the relative efficacy of the two treatments.<sup>18</sup> Bupropion can cause dry mouth and insomnia, but in the trials serious side effects were rare. The manufacturers report a 0.1% risk of seizures when up to 300 mg/day of sustained release bupropion is used.<sup>19</sup> In two trials the tricyclic antidepressant nortriptyline was effective (2.83, 1.59 to 5.03). One abstract reported efficacy for fluoxetine, a selective serotonin reuptake inhibitor, but the results of other studies have not yet been published.<sup>20</sup>

It is not clear how antidepressant drugs aid smoking cessation. Smoking and depression are known to be linked, but whether this reflects a common genetic predisposition or neurochemical effects of nicotine is uncertain. In the trials they were effective whether or not depression was present. Whether efficacy for smoking cessation is a class effect or drug specific is also unknown.

### Other pharmacological therapies

Licensed primarily as an antihypertensive, clonidine shares some pharmacological effects with bupropion and tricyclic antidepressants. The Cochrane review of six clinical trials showed evidence of efficacy (1.89, 1.30 to 2.74), but its usefulness is limited by appreciable sedation and postural hypotension.<sup>21</sup> The nicotine antagonist mecamylamine has been investigated as a cessation aid in combination with nicotine replacement but is not licensed for this use. The two studies show that mecamylamine, started before cessation and continued afterwards, may help smoking cessation.<sup>22</sup> They also show that a combination of mecamylamine and nicotine replacement, started before cessation, may increase the rates of cessation beyond those achieved with nicotine alone.

Lobeline is a partial nicotine agonist derived from the leaves of an Indian tobacco plant (*Lobelia inflata*) and has been used in proprietary smoking remedies. The Food and Drug Administration no longer permits it to be marketed in the United States, although Health Canada has recently licensed a cessation aid containing lobeline. The Cochrane review found no trials with six months of follow up. An unpublished study of a sublingual tablet found no evidence of efficacy at six weeks.<sup>23</sup>

## Other therapies

The Cochrane review of 20 trials found no benefit of acupuncture compared with sham acupuncture. Acupuncture may be better than doing nothing, but this is likely to be a placebo effect.<sup>24</sup> The Cochrane review of nine small trials of hypnotherapy found it no more effective than other behavioural interventions.<sup>25</sup> Hypnotherapy is difficult to evaluate in the absence of a sham procedure to control for non-specific effects. The existing evidence does not show a clear benefit for exercise in smoking cessation.<sup>26</sup>

## Conclusions

Social attitudes, legislation, and public health measures influence changes in tobacco use. Against this background, many smokers give up without clinical intervention. Nevertheless, most health professionals believe that they should help people who are seeking to stop.<sup>27</sup> This review shows that effective strategies are available to individuals and the health professionals who advise them. Few studies have directly compared the available treatments, so it is difficult to recommend one approach over another. Many people who smoke make multiple attempts to quit and will benefit from the availability of a range of aids to help them.

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- 1 Peto R, Lopez AD. The future worldwide health effects of current smoking patterns. In: Koop CE, Pearson CE, Schwarz MR, eds. *Critical issues in global health*. New York: Jossey-Bass (in press).
- 2 Hughes JR. Four beliefs that may impede progress in the treatment of smoking. *Tob Control* 1999;8:323-6.
- 3 Raw M, McNeill A, West R. Smoking cessation guidelines for health professionals: a guide to effective smoking cessation interventions for the health care system. *Thorax* 1998;53(suppl):S1-19.
- 4 Yusuf S, Peto R, Lewis J, Collins R, Sleight P. Beta blockade during and after myocardial infarction: an overview of the randomized trials. *Prog Cardiovasc Dis* 1985;27:335-71.
- 5 Silagy C, Mant D, Fowler G, Lancaster T. Nicotine replacement therapy for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 6 Silagy C. Physician advice for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 7 Rice VH, Stead LF. Nursing interventions for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 8 Stead LF, Lancaster T. Group behaviour therapy programmes for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 9 Lancaster T, Stead LF. Individual behavioural counselling for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 10 Hollis JF, Lichtenstein E, Vogt TM, Stevens VJ, Biglan A. Nurse-assisted counseling for smokers in primary care. *Ann Intern Med* 1993;118:521-5.
- 11 Hajek P, Stead LF. Aversive smoking for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 12 Lancaster T, Stead LF. Silver acetate for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 13 Lancaster T, Stead LF. Self-help interventions for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 14 Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot* 1997;12:38-48.
- 15 Blondal T, Gudmundsson LJ, Olafsdottir I, Gustavsson G, Westin A. Nicotine nasal spray with nicotine patch for smoking cessation: randomised trial with six year follow up. *BMJ* 1999;318:285-8.
- 16 Hughes JR, Stead LF, Lancaster T. Anxiolytics and antidepressants for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 17 Jorenby DE, Leischow SJ, Nides MA, Rennard SI, Johnston JA, Hughes AR, et al. A controlled trial of sustained-release bupropion, a nicotine patch, or both for smoking cessation. *N Engl J Med* 1999;340:685-91.
- 18 Hughes JR. Smoking cessation. *N Engl J Med* 1999;341:610-1.
- 19 Zyban (bupropion hydrochloride) sustained-release tablets [patient information leaflet]. Uxbridge: GlaxoWellcome, 1999.
- 20 Niaura R, Spring B, Keuthen NJ, Kristeller J, DePue J, Ockene J, et al. Fluoxetine for smoking cessation: a multicenter randomized double blind dose response study [abstract]. *Ann Behav Med* 1997;19(suppl):S042.

- 21 Gourlay SG, Stead LF, Benowitz NL. Clonidine for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 22 Lancaster T, Stead LF. Mecamylamine for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 23 Stead LF, Hughes JR. Lobeline for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 24 White AR, Rampes H, Ernst E. Acupuncture for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 25 Abbot NC, Stead LF, White AR, Barnes J, Ernst E. Hypnotherapy for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 26 Ussher MH, West R, Taylor AH, McEwen A. Exercise interventions for smoking cessation. In: Cochrane Collaboration. *Cochrane Library*. Issue 3. Oxford: Update Software, 2000.
- 27 McAvooy BH, Kaner EF, Lock CA, Heather N, Gilvarry E. Our healthier nation: are general practitioners willing and able to deliver? A survey of attitudes to and involvement in health promotion and lifestyle counselling. *Br J Gen Pract* 1999;49:187-90.

## The economics of global tobacco control

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Few people now dispute that smoking is damaging human health on a global scale.<sup>1</sup> However, many governments have avoided taking action to control smoking—such as higher taxes—because of concerns that their interventions might have harmful economic consequences, such as permanent job losses.

In 1997 the World Bank, in partnership with the World Health Organization, began a global study on the economics of tobacco control. A team of over 40 economists, epidemiologists, and tobacco control experts critically examined the current state of knowledge about tobacco control. The aim was to provide a sound and comprehensive evidence base for the design of effective tobacco control policies in any country, with an emphasis on the needs of the low income and middle income countries, where most smokers live. A synopsis of this work, including interim results, was published in 1999.<sup>2</sup> Final results, including 19 chapters and a statistical appendix, are now available.<sup>3</sup> This article presents the key findings from this study.

### Methods

Each chapter of the study relied on extensive literature searches and contact with experts working in the area. A study database was compiled from various sources: the WHO's tobacco database ([www.who.int/toh/Library/whopub.htm](http://www.who.int/toh/Library/whopub.htm)); agricultural data on consumption ([www.econ.ag.gov/briefing/tobacco/](http://www.econ.ag.gov/briefing/tobacco/)); a commercial tobacco database ([www.marketfile.com](http://www.marketfile.com)); a World Bank survey of over 70 countries on consumption, prices, taxes, control policies, and other variables ([www.worldbank.org/html/extdr/hnp/health/tobacco.htm](http://www.worldbank.org/html/extdr/hnp/health/tobacco.htm)); and World Bank macroeconomic and demographic data ([www.worldbank.org/data/wdi2000/](http://www.worldbank.org/data/wdi2000/)). This study database was used to estimate smoking prevalence across the seven World Bank regions, price levels across countries, the effectiveness and cost effectiveness of interventions, the impact of bans on advertising and promotion, the estimation of revenues, the impact of trade on consumption, and the impact of tax increases on smuggling. Some analyses, such as for smuggling, were restricted to the set of countries for which complete data were available. Details of specific methodologies are provided in each chapter of the study.<sup>3</sup> Anonymous peer reviewers reviewed each chapter.

### Summary points

Tax increases are the single most effective intervention to reduce demand for tobacco (tax increases that raise the real price of cigarettes by 10% would reduce smoking by about 4% in high income countries and by about 8% in low income or middle income countries)

Tax comprises about two thirds of retail price of cigarettes in most high income countries but is less than half of the total price on average in lower income countries

Improvements in the quality and extent of information, comprehensive bans on tobacco advertising and promotion, prominent warning labels, restrictions on smoking in public places, and increased access to nicotine replacement treatments are effective in reducing smoking

Reducing the supply of tobacco is not effective in reducing tobacco consumption

Comprehensive tobacco control policies are unlikely to harm economies

### Findings

#### Scale of the problem

About 80% of the world's 1.1 billion smokers live in low income and middle income countries.<sup>4</sup> Data from high income countries, where the tobacco epidemic is well established among men, suggest that about half of long term regular smokers are killed by tobacco and that, of these, about half die in middle age (35-69 years old). Worldwide, about four million people died of tobacco related disease in 1998.<sup>4</sup> This figure is expected to rise to 10 million annual deaths by 2030, with 70% of these deaths occurring in low income countries. Peto and Lopez estimate that about 100 million people were killed by tobacco in the 20th century and that, for the 21st century, the cumulative number could be one billion if current smoking patterns continue.<sup>1</sup> Many of these deaths over the next few decades could be prevented if current smokers quit, but in low income and middle income countries quitting is rare. For

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showing the  
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